

**The Knowledge Bank at The Ohio State University**  
**Ohio State Engineer**

**Title:** Engineering Review

**Issue Date:** Oct-1934

**Publisher:** Ohio State University, College of Engineering

**Citation:** Ohio State Engineer, vol. 18, no. 1 (October, 1934), 7, 12-15.

**URI:** <http://hdl.handle.net/1811/35154>

**Appears in Collections:** [Ohio State Engineer: Volume 18, no. 1 \(October, 1934\)](#)

# Engineering Review



## Two-way Radio Police Cars

One day this summer, the head of the police signal department of Boston was cruising in a light sedan around the outskirts of Schenectady, N. Y. There was no telltale evidence of an antenna or other special equipment, yet the car was a radio prowler car, equipped for two-way communication. While the car was moving, he picked up a French-type telephone which hung on the dashboard in front of him and spoke to temporary "headquarters" several miles away. Then with the aid of a long-distance telephone connection from "headquarters," he spoke to Police Commissioner Eugene C. Hultman at his Boston office. Both voices came through clearly and the tests were pronounced very satisfactory. As a result, Boston is to have a mobile two-way system of police communication.

Ultra-high frequencies were selected for the new two-way system. These frequencies have the advantages of less crowded bands, less interference, particularly at night, and the antenna installations are comparatively less awkward and expensive.

The stationary transmitter for the Boston system will be located at headquarters, and will be connected with precincts or division houses by telephone lines. Power transmitters in different localities will have different frequencies, but the receivers of all cars will be tuned to headquarter's frequency. The receivers of the division houses will be tuned to the car transmitters in their respective divisions.

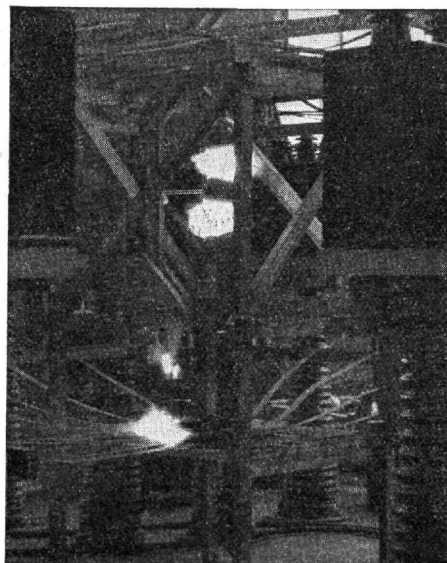
## A Quarter of a Million Amperes

Electrical engineers have at last equalled and perhaps surpassed natural lightning in one regard at least. In the high voltage laboratory of the General Electric Company they have produced discharges of approximately a quarter of a million amperes, which exceed the current of any direct lightning strokes yet recorded.

Just as natural lightning destroys that which it strikes, so does the laboratory discharge; and just as natural lightning is accompanied by deafening thunder, the laboratory discharges have their ear-splitting crashes. A copper wire a tenth of an inch in diameter is completely vaporized in the few millionths of a second required for the discharge. A similar piece of iron wire is "exploded." A section of reinforced concrete is smashed into bits, just as a concrete structure is shattered when struck by natural lightning. Metallic armored (BX) cable is destroyed, or may be ignited. The pressure will shatter a pane of glass several inches away when the discharge is in open air.

In contrast to the impressive, towering apparatus required to produce high-voltage discharges, the high current generator is extremely compact. Ninety-six Pyranol-filled capacitors—big brothers of the familiar condenser—are arranged in a hollow square of 88 inches inside dimensions, four feet above the floor on a wooden platform resting on insulators. Each side of the square contains 24 of the capacitors, arranged three across and eight along the side. The individual capacitors are rated at 50,000 volts each.

*(Continued on page 12)*



## ENGINEERING REVIEW

(Continued from page 7)

### Electric "Eyes" Stop Elevator Cars

Two electric eyes, known as photo-electric tubes, are entrusted with the stopping of the 36 high speed elevators at the floors in the 69 story Rockefeller Tower in Radio City, New York, according to an announcement by the Westinghouse Electric & Manufacturing Company in whose laboratories this latest type of automatic stopping was developed.

Up and down the 850 feet of darkened elevator shaft, two electric eyes ride each fast moving car. The photo tube's cold, calculating stare brings the car to a stop level with any desired floor and with extreme accuracy.

The photo electric cell's usefulness is due to its peculiar reaction to light. When the sensitive, coated-metal cathode inside the tube is illuminated by an outside source,



the tube allows an electric current to pass through its circuit. If the outside source ceases to emit light, or if its rays are interrupted before striking the tube, no current can pass.

Application of the electric eye to the stopping of elevators is very simple. A small automobile headlight bulb is mounted upon a control panel on the side of the car. An "up" controlling photo tube is mounted level with the light bulb and about three inches from it; three inches on the opposite side the "down" photo tube is mounted. Thin metal vanes fastened to the guide rails and extending into the shaft, control the movement of the elevator by intercepting the light's rays on one of the two photo-tubes as the car slows down, and stopping the car by completely intercepting the rays to both tubes when the car reaches the correct floor level.

Compared with mechanical devices, electric eye control operates with greater accuracy and quietness, does not lose its sensitiveness due to wear, and requires less adjustment by service men. It is more compact, weighs less, has no moving parts, entails no complicated cam construction.

Among the many other applications of photo electric control are the safeguarding of passengers from injury by elevator doors; the sorting of cards by their color, size or shape; the selective control of automobile traffic, the

matching of colors, the detection of fires, burglar protection by means of doors; the detection of faults in electrical machinery; measurement of illumination; control of lighting; analyzing and recording of smoke content.

### Skyhooks

Do you recall the distant days of youth when some wag sent you all over town looking for a left-handed monkey wrench? Or a spool of pipe thread? At the first shop you went to the man was very helpful. He had loaned it not five minutes ago. He was SO sorry, but he knew another shop where they might have it. So around town you went finally returning without it.

You vowed never to be fooled again, but then one day you stopped to watch a carpenter building a house. Suddenly he stopped work, turned to you and said, "Boy, I can't do any more on this house until I get some skyhooks. Run down to the corner hardware store and get me a couple, will you?" Obliging you went. In fact, you went to the second store before you began to wonder about it, so you went back to the house to find out what sort of a contraption a skyhook was. It was to hook the house to the sky, the carpenter said, while he built the foundation under it.

Of course, you couldn't be fooled like that now. You realize that buildings are not built from the top down. The foundations are laid first, and however handy a skyhook might be, "there ain't no such animal." The same is true for anything you wish to build—material or otherwise. For permanence you start at the bottom with the proper foundation and build up. Yet many people spend their lives looking for "skyhooks."

I have a student in mind whom I have known over a period of five or six years. He has been planning (or should we say dreaming?) that some day he would enter a famous engineering school. However, he has never exerted himself to do more than C or D work in those fields basic to an engineering education—mathematics and science. He had an answer for this. This school admitted by examination, and his theory was that when the time for entrance examinations came he would really get down and dig. What do you think the outcome will be?

This jumble of "skyhooks" and scholarship may seem unrelated to you but to me there is a parallel. No doubt this very student couldn't be sent on such a crazy errand. He'd recognize the fallacy of grabbing at skyhooks, instead of building the foundation first. In fact, he wouldn't even think of that; he'd laugh at you for thinking him so simple. If the question of scholarship were put to him directly, he'd even admit verbally the fallacy there. But he won't do anything about it, for in the back of his mind he's holding thought that there is an easier way out of it. The worst thing about this type of reasoning is that it is not limited to the days of youth. In a sense some people are always hunting for left handed monkey wrenches, clinging to skyhooks, and waiting till New Years to make their good resolutions.

—*Engineering Magazine.*



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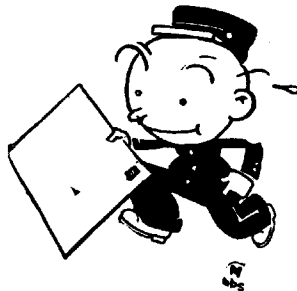
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### **Manhattan's Newest Lightning Rod**

A modern lightning protection system has recently been installed on the new 616-foot General Electric building in New York City. Thus the structure becomes in effect Manhattan's newest lightning rod, because the system, in addition to guarding the building itself from damage by lightning, provides a certain amount of protection to nearby lower structures. This fact was discovered by high-voltage engineers of the company through investigations of both real and man-made lightning. A low lightning rod is particularly effective in this respect in proportion to its height. A rod 100 feet high will protect a flat area surrounding it for a distance of approximately 400 feet from the base of the rod, when the storm cloud is not lower than 1000 feet. A 500-foot rod will protect an area 650 feet in radius. A 1000-foot rod will protect an area at least 1000 feet in radius. This is assuming a flat area. All structures wholly within an imaginary cone, the apex of which is the tip of the lightning rod and the base of which is the protected area, receive the benefit of the rod.

### **Floating Banana Platters**

Some tall yarns have been told about river boats that could float on a heavy dew. Recently, however, 27 barges were built at New Orleans, which do not require much more moisture for sailing. Although they are 60 feet long and made of steel, they draw only six inches of water.

The barges were built for service in transporting bananas on the shallow rivers of Central America. They are 60 feet long, 20 feet wide, and three feet deep. In order to withstand the corrosive action of salt water, the hulls and decks of these floating platters were made of sheets of Armco iron one-eighth of an inch thick, sewed together by General Electric welding equipment.

### **Propeller Noise Detector**

A new type of "zeppelin" recently arrived at Langley Field in Virginia. Although it is a bit too heavy ever to leave the ground, this new craft may prove to be an important factor in the development of aircraft propellers in the future.

It is an induction motor housed in a cigar-shaped steel casing, with a shaft extension for the direct mounting of a propeller. It will be used to investigate the noise made by the various types of propeller, with a view to designing a propeller in which the noise is reduced to the practical minimum.

To meet this purpose, the motor had to be designed so that its speed could be very accurately controlled over a range from 1000 to 3600 rpm. This is accomplished by means of two complete sets of 13-point drum control, electrically connected so that one acts as a vernier between each pair of points of the other. A small generator mounted in-

side the casing is connected to a distant meter, calibrated to indicate the exact speed of the motor in rpm.

As the propeller is tested, the sound waves are received by a microphone and analyzing apparatus so that a complete stury of noises can be made. To make it possible to receive the sound waves emanating from the various angles of the blades without having to move the microphone equipment, the motor is mounted on a swiveling pedestal. Both the pedestal and casing are streamlined to reduce resistance to the air stream and to minimize the reflection of sound waves.

The motor itself is probably the first of its kind ever built. It is of the wound-rotor induction type, rated 200 horsepower at 3600 rpm. It is of 2-pole, 3-phase design and operates at 60 cycles and 2300 volts. Engineers of the General Electric Company, which built the equipment, met difficult problems in design and construction, in that the motor with all its mechanical parts and fittings had to fit snugly into the 30-inch diameter casing. The motor is of weatherproof construction as the equipment will be mounted outdoors. The swivel trunnion is mounted in a heavy concrete base.

#### **Invention Thrives Under Depression**

America's inventive genius is thriving under the depression. The Patent Office at Washington is issuing about 1,000 patents a week. The number of American patents will soon total 2,000,000, while all other countries together have issued but 4,000,000 patents. Despite this activity American inventors have been lacking in proper technical training to make the most of their ideas. For the first time in the long history of invention, courses of instruction are now offered for inventors in our great universities and by correspondence schools. This educational movement has been made possible by the Inventors' Foundation, an organization which has instituted courses at New York University, Stevens Institute of Technology, International Correspondence Schools, and Blackstone Institute. The Foundation has been created by Henry J. Gaisman, one of America's foremost inventors.

Although the courses are prepared primarily for inventors, they also serve executives and lawyers who are interested in the new product field. Instruction is offered in the technical and commercial development of inventions. The inventor studies the various steps in inventing, the analysis and classification of various inventions, the law relating to patents, the evaluation of various kinds of inventions—in short, what will prove profitable to invent, and what to do with it after inventing it.

The courses inform inventors how to study the markets to discover just what ideas are most in demand, and how inventive ideas may be profitably developed. Practical instruction is given in how to prepare invention records, how to select a patent attorney, the nature of infringements, and countless other details that will assure for the inventor a proper share of the profits. Hundreds of inventors are now being enrolled in these special courses, which are recognized to fill a long-felt want.

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